Results on main elasmobranch species captured in the bottom trawl surveys on the Northern Spanish Shelf

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Abstract

This working document presents the results on the most significant elasmobranch fish species in the Spanish Groundfish Survey on Northern Spanish shelf in 2012. In decreasing order the main species in biomass terms in this survey are Scyliorhinus canicula, Raja clavata, Galeus melastomus, Raja montagui, Etmopterus spinax and Leucoraja naevus. Biomass, distribution and length ranges were analysed. A marked increase in biomass of almost all species with regard to previous years was found, especially in S. canicula and R. clavata in IXa Division. L. naevus and G. melastomus were the only species which decreased in VIIIc Division.

Introduction

The bottom trawl survey on the Northern Spanish Shelf aim to provide data and information for the assessment of the commercial species and the ecosystems on the Galician and Cantabrian shelf (ICES Divisions VIIIc and IXa North) (ICES, 2010).
The aim of this working document is to report the results (abundance indices, length frequency distributions and geographic and bathymetric distributions) on the most common elasmobranch fish species in 2012 survey following the results presented previously (Velasco et al., 2010; Ruiz-Pico et al., 2011; Fernández-Zapico et al., 2012).
The species analysed in this working document are: *Scyliorhinus canicula* (lesser spotted dogfish), *Scyliorhinus stellaris* (nursehound), *Galeus spp*. (*G. melastomus* and *G. atlanticus*), *Etmopterus spinax* (velvet belly lantern shark), *Deania calcea* (birdbeak dogfish), *Deania profundorum* (arrowhead dogfish), *Hexanchus griseus* (bluntnose sixgill shark), *Scymnodon ringens* (knifetooth dogfish), *Raja clavata* (thornback ray), *Raja montagui* (spotted ray), *Leucoraja naevus* (cuckoo ray), *Raja brachyura* (blonde ray) and *Leucoraja circularis* (sandy ray).

Material and methods

The survey was carried out on board the R/V "Cornide de Saavedra", between September 21th and October 24th, 2012.
The standard IBTS methodology for the western and southern areas (ICES, 2010) was applied. The sampling design was random stratified with five geographical sectors (MF. Miño-Finisterre, FE. Finisterre-Estaca de Bares, EP. Estaca de Bares - Peñas, PA. Peñas

- Ajo, AB. Ajo - Bidasoa) (Figure 1). Depth stratification changed in 1997 from 30-100 m, 101-200 m, 200-500 m to 70-120 m, 121-200 m and 201-500 to overcome the shortage of grounds shallower than 70 m that hindered the coverage of this stratum. Nevertheless, hauls shallower than 70 m and deeper than 500 m are considered additional hauls and performed every year if possible. These additional hauls are plotted in the distribution maps, although they are not included in the calculation of the stratified abundance indices since the coverage of these grounds (deep and shallow) is not considered representative of the area. The information from these depths is considered relevant due to the changes in the depth of fishing activities in the area (Punzón et al. 2011), and these hauls are also used to define the depth range of the species.

Results

Standard sampling carried out (Figure 1) had 126 hauls, and 13 additional hauls, 2 shallower than 70 m, and 11 deeper than 500 m. Mean total catch per haul was 161.9 ±14.83 kg. Total fishes catch represented about 90% of the total, while elasmobranchs made up ca. 11% of this total fish catch.

The species registered in 2012 in the stratified sampling area and their respective percentages of the elasmobranchs stratified catch were: *S. canicula* (57%), *S. stellaris* (0.3%), *G. melastomus* (11%), *G. atlanticus* (0.1%), *E. spinax* (1%), *R. clavata* (25%), *R. montagui* (4%) and *L. naevus* (1%). Besides, other elasmobranchs occurred also in the additional hauls, namely *D. calcea*, *D. profundorum*, *H. griseus*, *S. ringens*, *R. brachyura* and *L. circularis*.

Scyliorhinus canicula (lesser spotted dogfish) and *S. stellaris* (nursehound)

A steep increase in biomass of *S. canicula* was found in IXa Division in this last survey, the biomass catch increased from 2.12 Kg·haul^{-1} in 2011 to 7.98 Kg·haul^{-1} in 2012, the largest value of the overall time series. In VIIIc Division a slighter increase was found, continuing with the high trend of the last 6 years, trend that coincides with that in IXa. On the other hand, *S. stellaris* also showed a biomass rise this last survey, especially in IXa Division where it has not been found for 17 years (Figure 2).

S. canicula was widespread in the sampling area whereas *S. stellaris* was sparse and scarce, being more abundant in the central part of the Cantabrian Sea (Figure 3). Regarding depth range distribution, *S. canicula* was found from 80 to 457 m and *S. stellaris* from 97 to 441 m in 2012.

Lesser spotted dogfish length ranged from 11 to 68 cm in 2012 whereas, Nursehound showed a narrow length range, from 22 to 49 cm (Figure 4).

Galeus melastomus (blackmouth catshark) and *G. atlanticus* (Atlantic sawtail cat shark)

As shown in previous working documents (Ruiz-Pico *et al*., 2011, Fernández-Zapico et al., 2012), *G. melastomus* was recorded together with *G. atlanticus* before 2009. Now it is possible to do a comparative analysis between these species in the last four years.

Both species were scarce in standard hauls but frequent in additional hauls. As many as a 74% of the total biomass of *G. melastomus* and a 98 % of *G. atlanticus* were found over 500 m. Therefore, out of the standard stratification, *G. melastomus* increased slightly in IXaN Division in relation to 2011 and remains appearing on the deep hauls on the westernmost part of the survey area, whereas *G. atlanticus* remains scarce in the area, especially in VIIIc Division, with relative large catches on the deep hauls of IXa (Figure 5).

On the other hand, in the standard stratification, between 70 and 500 m, *G. melastomus* also increased slightly in IXaN Division and decreased in VIIIc Division in 2012, whereas *G. atlanticus* remained absent in IXaN Division and fell even more in VIIIc Division this last survey (Figure 6).
In 2012, Atlantic sawtail catshark was mainly found in the Galician area from 266 to 705 m depth whereas blackmouth catshark was widely found in the study area from 152 to 705 m depth (Figure 7).
Regarding length distribution, *G. melastomus* showed a high abundance of small individuals around 20 cm in IXaN Division, the smallest mode in the last ten years, whereas in VIIIc Division there were quite a few individuals but a wider range of sizes. The small abundance of *G. atlanticus* did not allow us to infer any conclusions or trends on the length distribution (Figure 8).

***Etmopterus spinax* (velvet belly)**

Around a 50 % of the biomass of this scarce elasmobranch was found in standards hauls and the other half was found deeper than 500 m. In IXa Division, *E. spinax* did not appear in standard hauls and it was really scarce in additional hauls. However, in VIIIc Division, the catches of this species increased reaching the highest value of the overall time series (Figure 9).
In 2012, *E. spinax* was caught from 284 to 705 m and it was mainly found in Galicia (Figure 10).
Velvet belly length distribution found in 2012 ranged between 11 and 42 cm, with more individuals of around 15 cm, and a second mode around 27 cm (Figure 11).

Other shark species

Other shark species are common in the additional deeper hauls, namely *Deania calcea, Deania profundorum, Hexanchus griseus, Scymnodon ringens* although they are scarce or absent on the stratified catches The *Deania* species were more abundant than the others and they increased in 2012. *H. griseus* also increased whereas *S. ringens* showed the low steady catches from 2010 (Figure 12).
Before 2009 *D. calcea* was recorded together with *D. profundorum*. In that year, *D. profundorum* was described within the area (Sanjuan *et al*., 2012), therefore the results previously reported as *D. calcea* are now merged into *Deania* spp. The results of the comparative analysis between *D. calcea* and *D. profundorum* in the last four years showed an increase in the catches of *D. calcea* in 2012, after being absent in the two previous years, whereas *D. profundorum* remained steady in the catches from 2010 in both Divisions (Figure 13).
The small biomass and scarcity of these species did not allow us to describe patterns in the spatial distribution (Figure 14).
Regarding depth range distribution on the overall time series, *Deania spp.* and *S. ringens* showed similar preference for deep waters while *H. griseus* showed a wide and shallower depth range (Figure 15).

***Raja clavata* (thornback ray)**

This is the most abundant ray in the area, and showed the highest values of the overall time series in 2012, around 4 $Kg \cdot haul^{-1}$ (taking into account only the standard hauls), with an abrupt increase in IXa Division, where low values were found in the whole historical series (Figure 16).

R. clavata was widespread in the sampling area and it was found between 46 and 320 m in 2012 (Figure 17).
Thornback ray individuals caught in 2012 ranged from 13 to 97 cm, being consistent with the historical series (Figure 18).

Raja montagui (spotted ray)

No catches of this species were recorded in IXa Division in 2012 as it occurred for the whole historical series. However, in VIIIc Division, a slight increase of the biomass was found after the low amount in 2011, remaining the downward trend from 2005 (Figure 19).
R. montagui extended from 80 to 184 m depth and it was distributed from the central to the easternmost area of the Cantabrian Sea in this last survey (Figure 20).
Spotted ray length ranged from 25 to 67 cm in 2012 (Figure 21).

Leucoraja naevus (cuckoo ray)

Like *R. montagui*, no records of *L. naevus* were found in IXa Division along the whole historical series. The VIIIc Division displayed a drop in the stratified biomass, returning to the values found in 2008 and 2003, the lowest ones in the last ten years (Figure 22).
This species extended from 127 to 296 m depth in 2012 and the spatial distribution of the small catches was similar to previous years, mainly in the central and eastern area of the Cantabrian Sea (Figure 23).
Cuckoo ray length distribution ranged from 22 to 63 cm in 2012 (Figure 24).

Other ray species

Other scarce ray species were found in the area in 2012, namely *Raja brachyura* and *Leucoraja circularis*. These species represented a percentage below 1% of the total elasmobranches fish species and they were just showed each one in two hauls of the total sampling, shallower and eastern hauls in the case of the first species (Figure 25).

Acknowledgements

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Figures

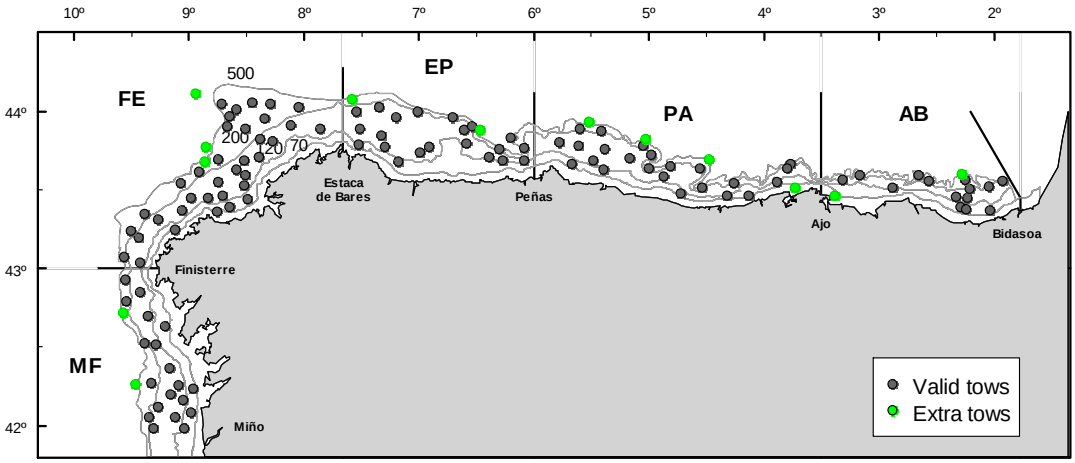

Figure 1 Stratification design and hauls on the Northern Spanish shelf groundfish survey in 2012; depth strata are: A) 70-120 m, B) 121 – 200 m and C) 200 – 500 m. Geographic sectors are MF: Miño-Finisterre, FE: Finisterre-Estaca, EP: Estaca-cabo Peñas, PA: Peñas-cabo Ajo, and AB: Ajo-Bidasoa.

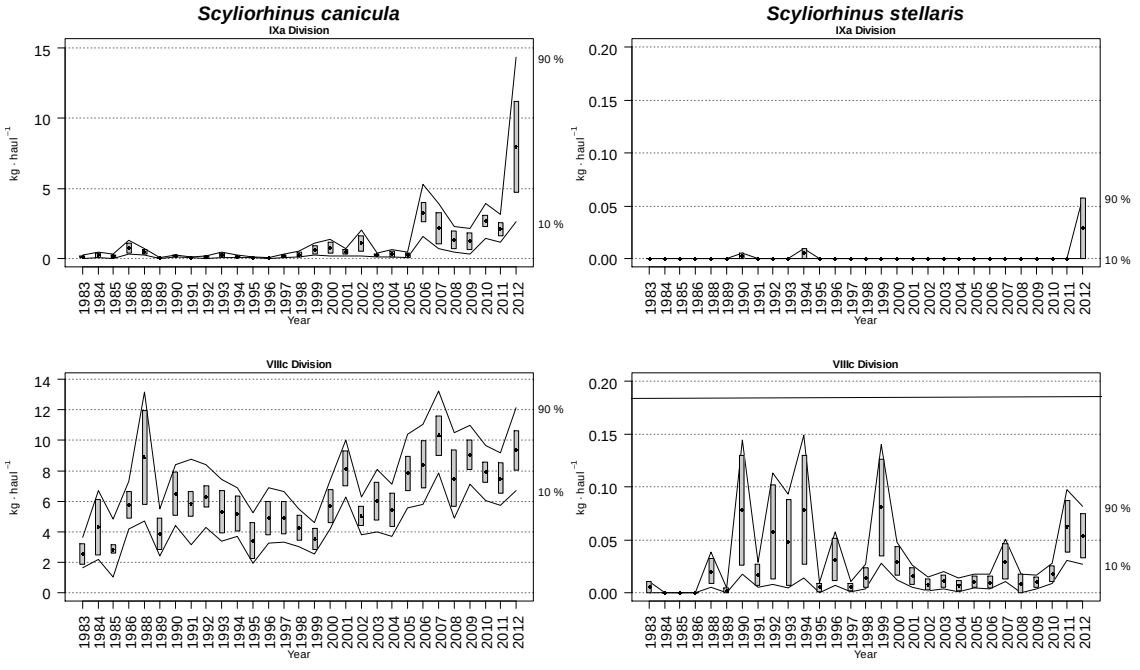

Figure 2 Changes in *Scyliorhinus canicula* and *Scyliorhinus stellaris* biomass index during the North Spanish shelf bottom trawl survey time series (1983-2012 but in 1987) in the two ICES divisions covered by the survey. Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

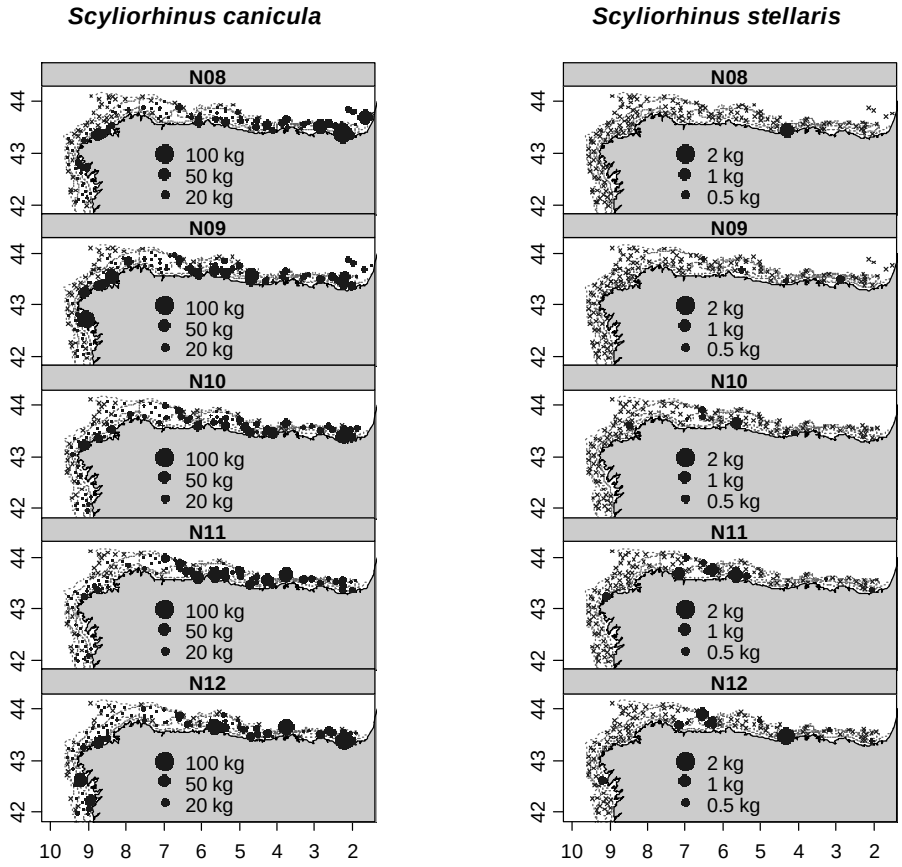

Figure 3 Geographic distribution of *Scyliorhinus canicula* and *Scyliorhinus stellaris* catches (kg/30 min haul) in North Spanish Shelf bottom trawl surveys between 2008 and 2012

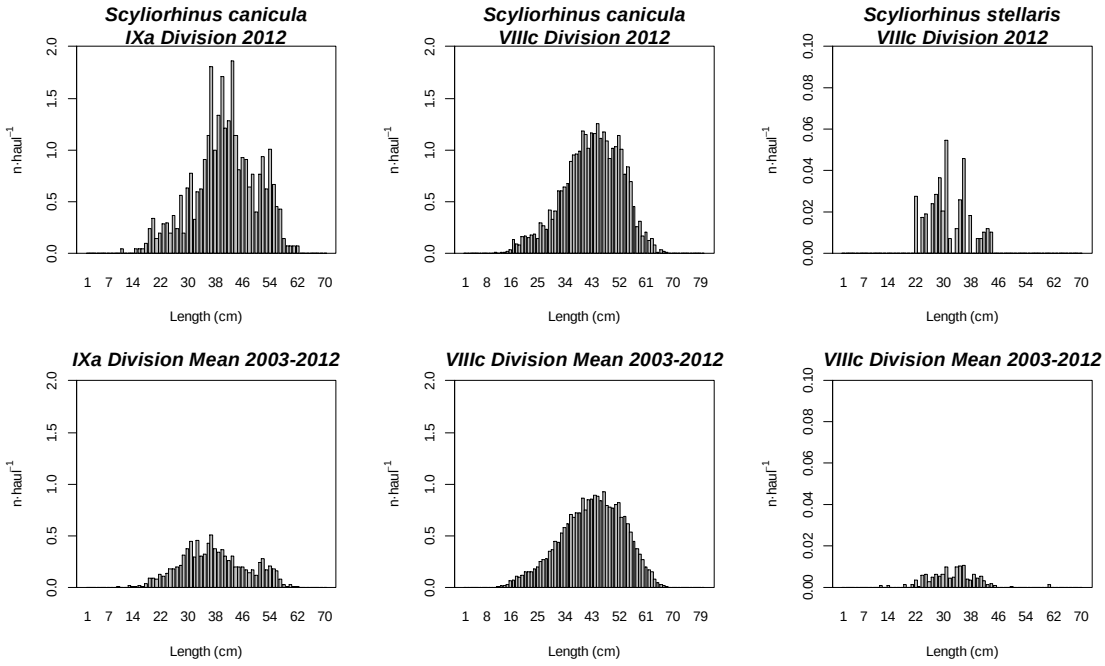

Figure 4 Stratified length distributions of *Scyliorhinus canicula* and *Scyliorhinus stellaris* in 2012 in the two ICES divisions covered by the North Spanish Shelf bottom trawl survey, and the mean values for the last decade in both areas (2003-2012)

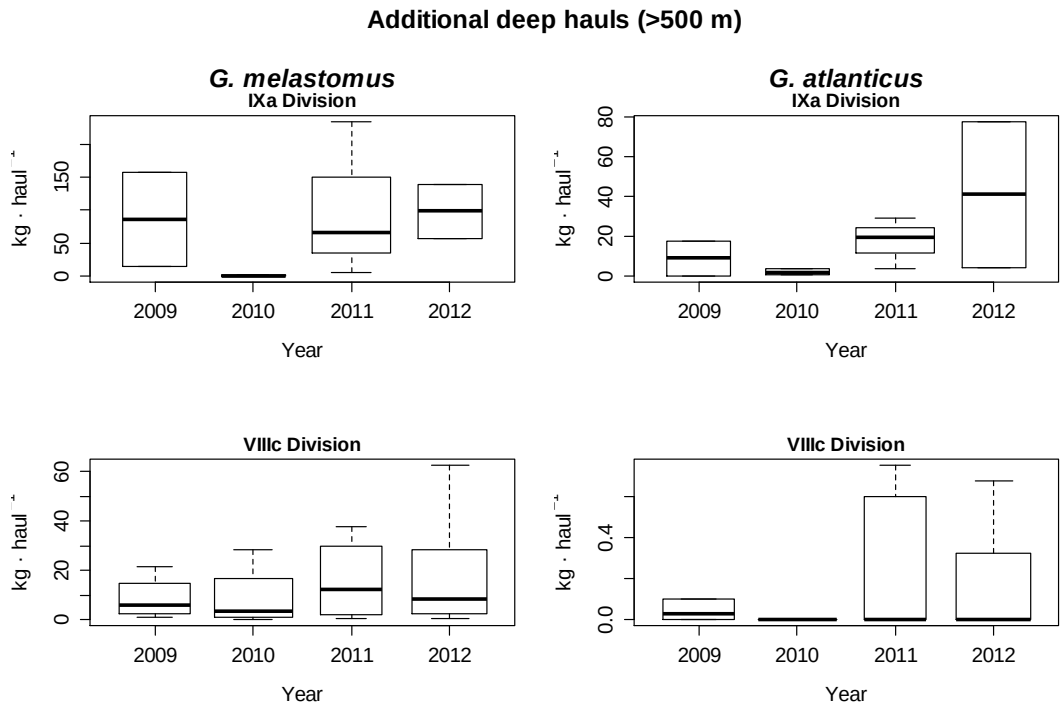

Figure 5 Evolution in the catches in biomass of *Galeus melastomus* and *Galeus atlanticus* in additional hauls out of the standard stratification (>500 m) between 2009 and 2012 in the two ICES divisions

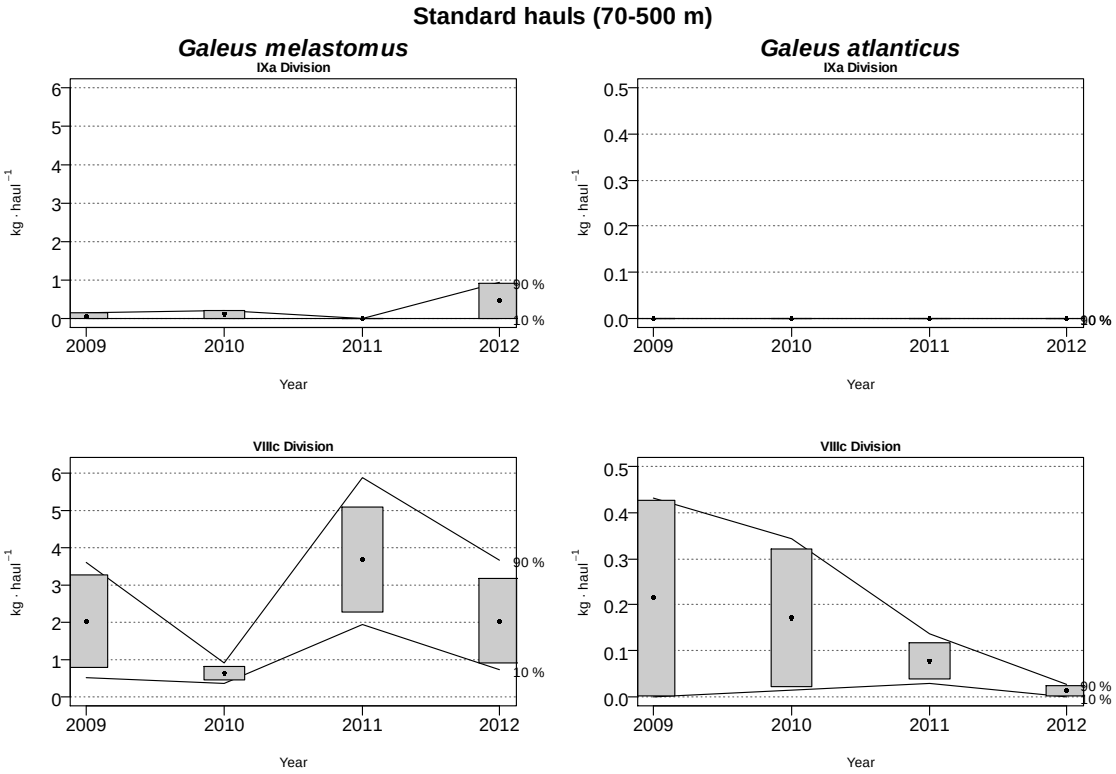

Figure 6 Changes in *Galeus melastomus* and *Galeus atlanticus* stratified biomass index (covering standard hauls between 70 and 500 m) during the North Spanish shelf bottom trawl survey between 2009 and 2012 in the two ICES divisions. Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

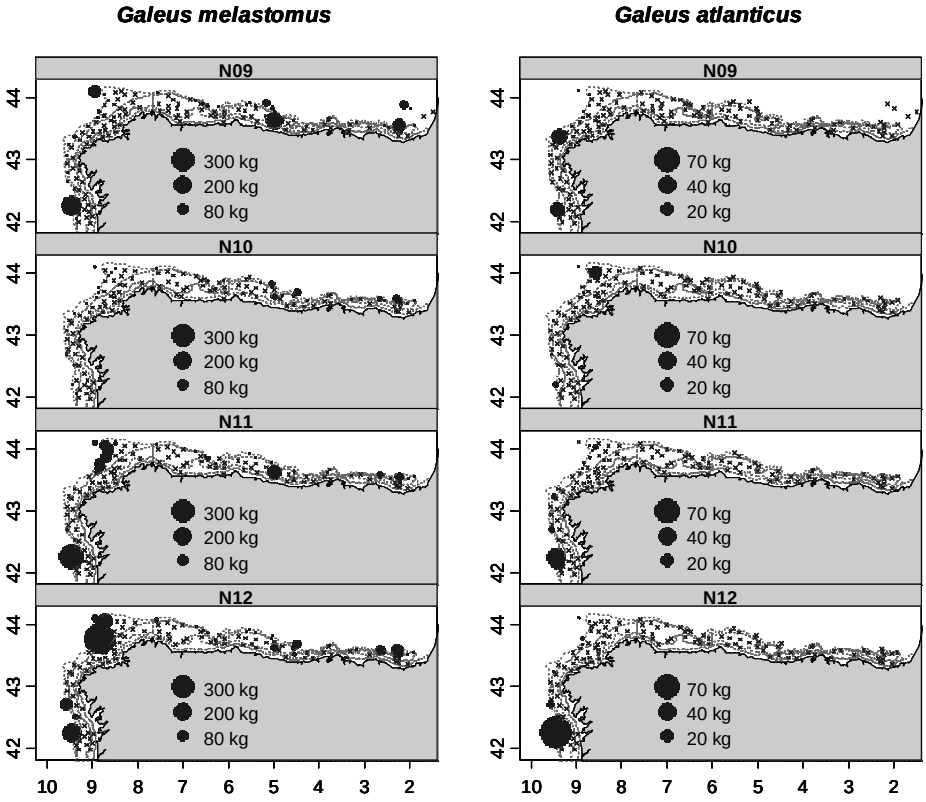

Figure 7 Geographic distribution of *Galeus melastomus* and *Galeus atlanticus* catches (kg/30 min haul) in North Spanish Shelf bottom trawl surveys between 2009 and 2012

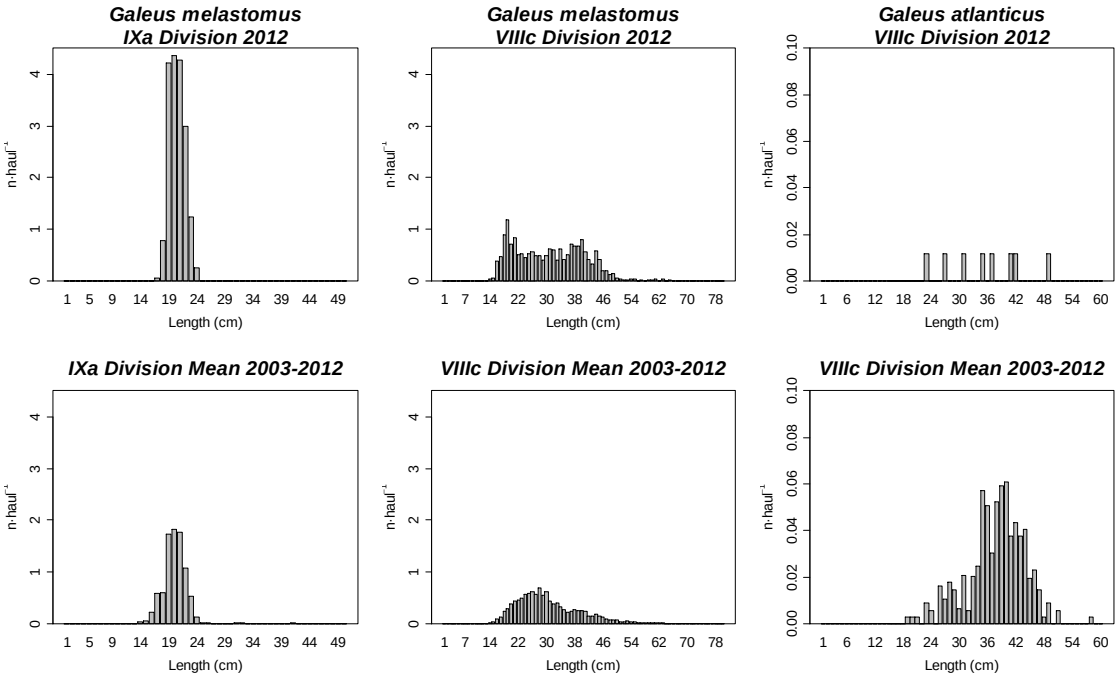

Figure 8 Mean stratified length distributions of *Galeus melastomus* and *Galeus atlanticus* in the North Spanish Shelf surveys (2003-2012)

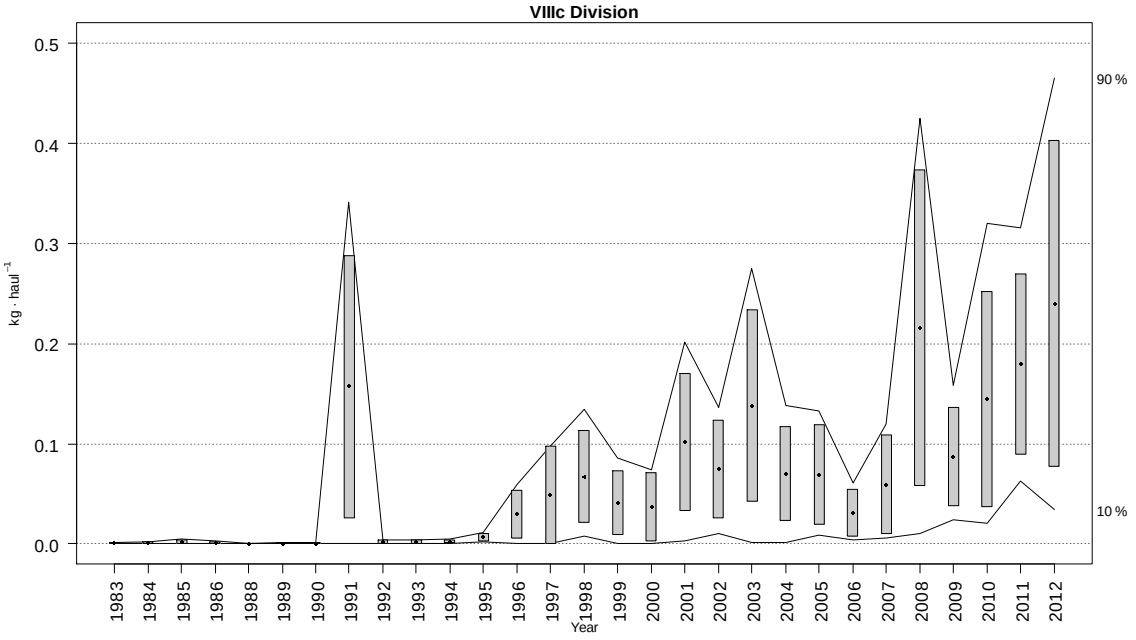

Figure 9 Changes in *Etmopterus spinax* biomass index during the North Spanish shelf bottom trawl survey time series (1983-2012 but in 1987) in the VIIIc division covered by the survey. Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

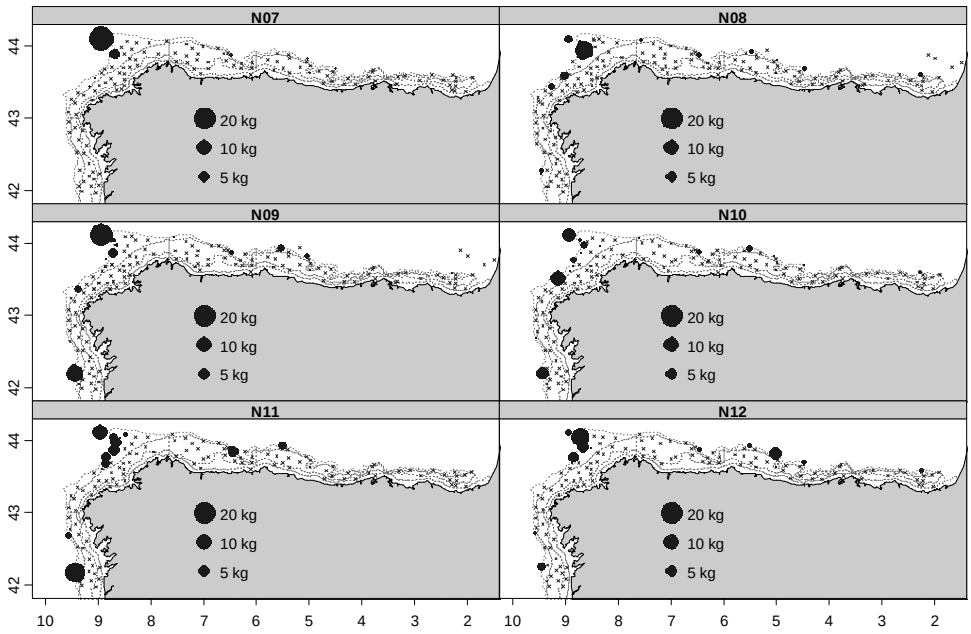

Figure 10 Geographic distribution of *Etmopterus spinax* catches (kg/30 min haul) in North Spanish Shelf bottom trawl surveys between 2007 and 2012

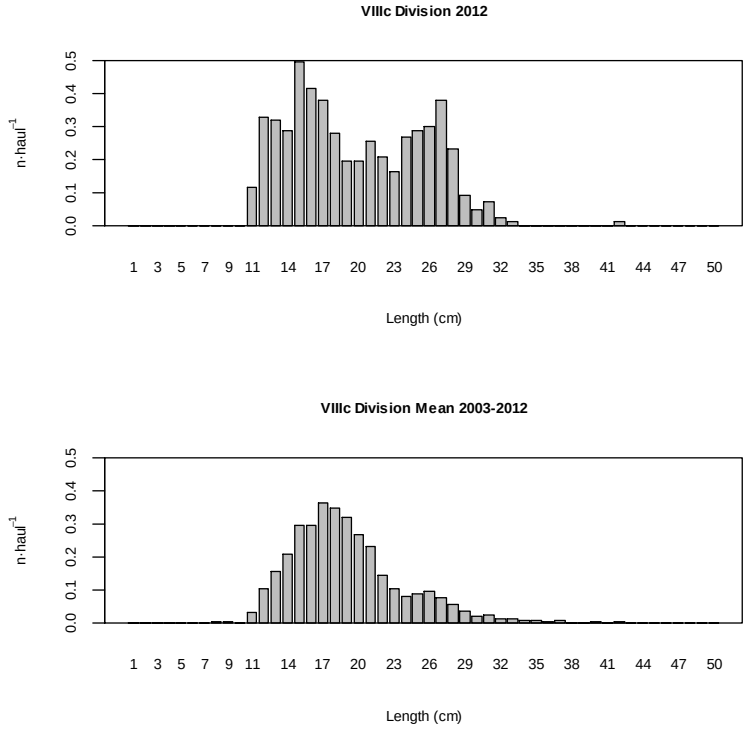

Figure 11 Mean stratified length distributions of *Etmopterus spinax* in the North Spanish Shelf surveys (2003-2012)

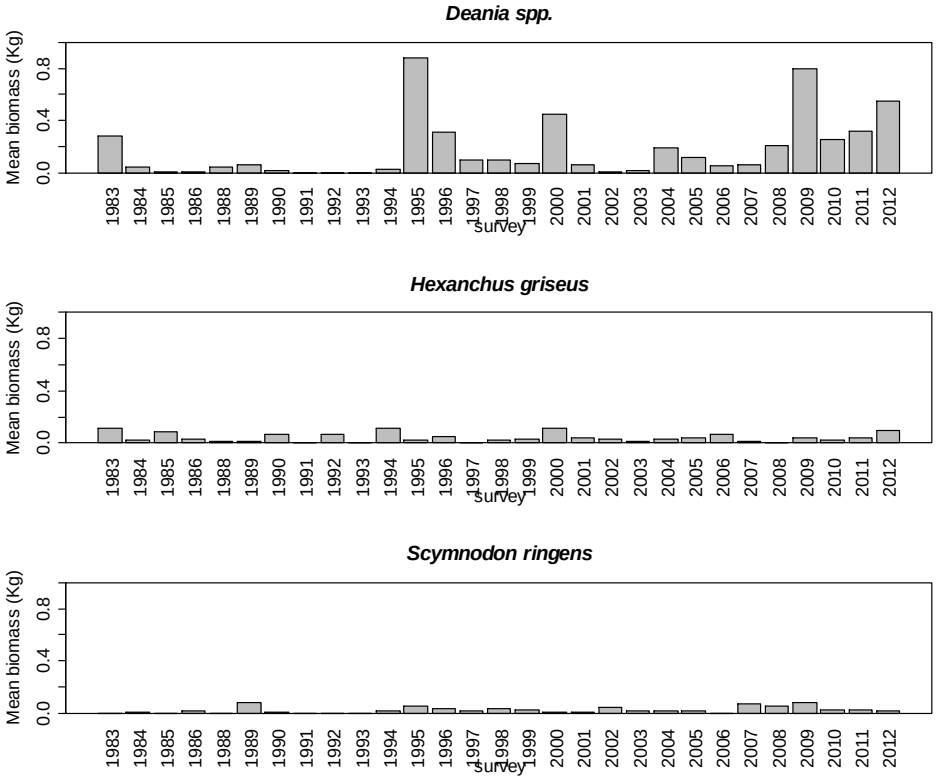

Figure 12 Evolution in the catches in biomass of *Deania spp.*, *Hexanchus griseus* and *Scymnodon ringens* during the North Spanish shelf bottom trawl survey time series (1983-2012 but in 1987)

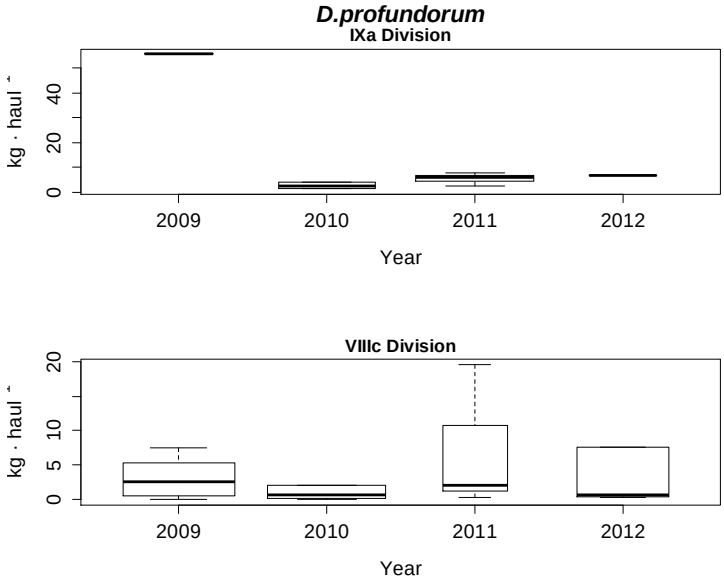

Figure 13 Evolution in the catches in biomass of *Deania profundorum* between 2009 and 2012 in the two ICES divisions

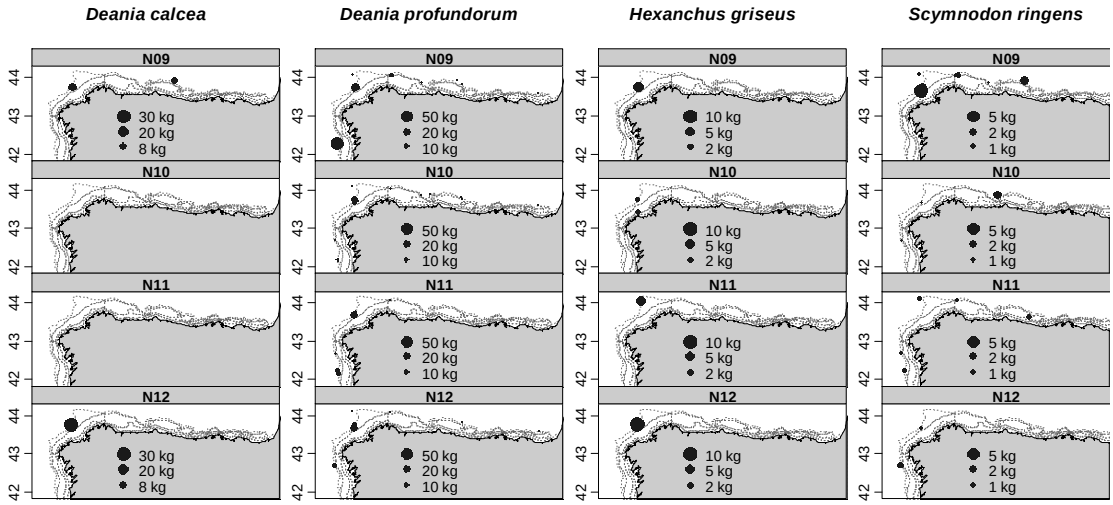

Figure 14 Geographic distribution of *Deania calcea*, *Deania profundorum*, *Hexanchus griseus* and *Scymnodon ringens* catches (kg/30 min haul) in North Spanish Shelf bottom trawl surveys between 2009 and 2012

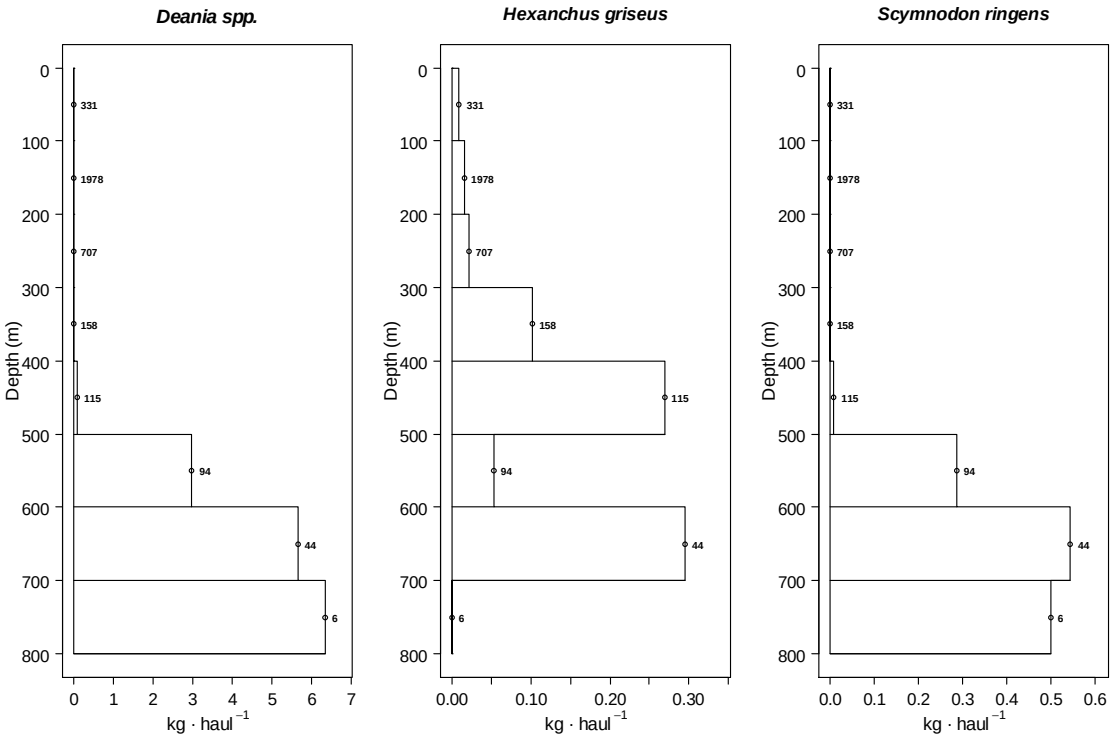

Figure 15 Depth distribution of *Deania spp.*, *Hexanchus griseus* and *Scymnodon ringens* catches (kg/30 min haul) in North Spanish Shelf bottom trawl surveys of the overall time series. Numbers mark total hauls

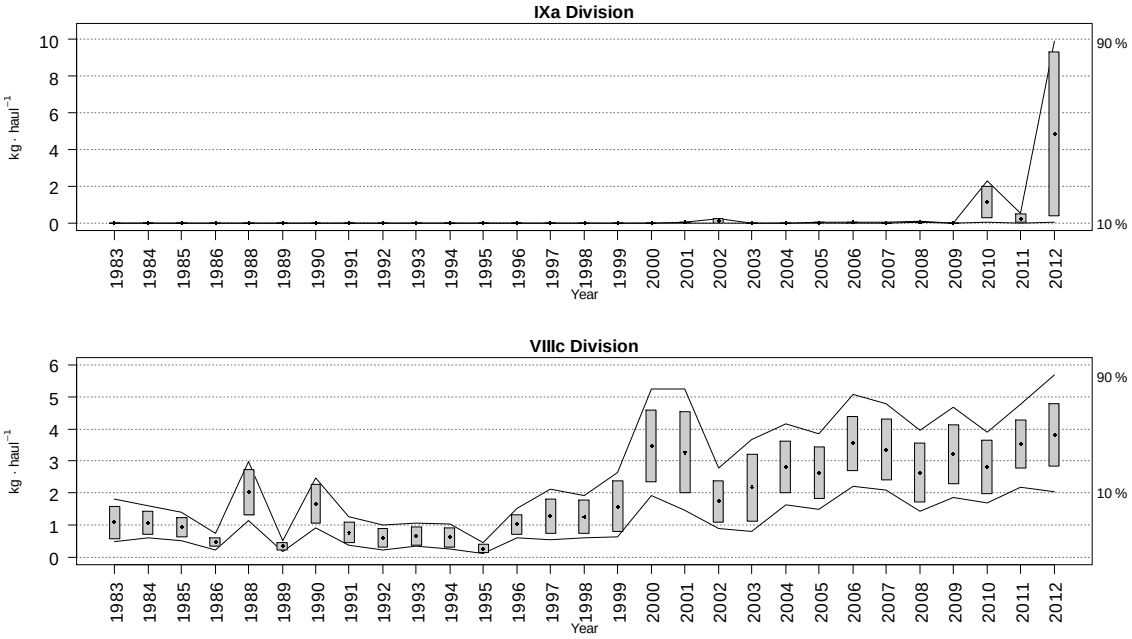

Figure 16 Changes in *Raja clavata* biomass index during the North Spanish shelf bottom trawl survey time series (1983-2012 but in 1987) in the two ICES divisions covered by the survey. Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

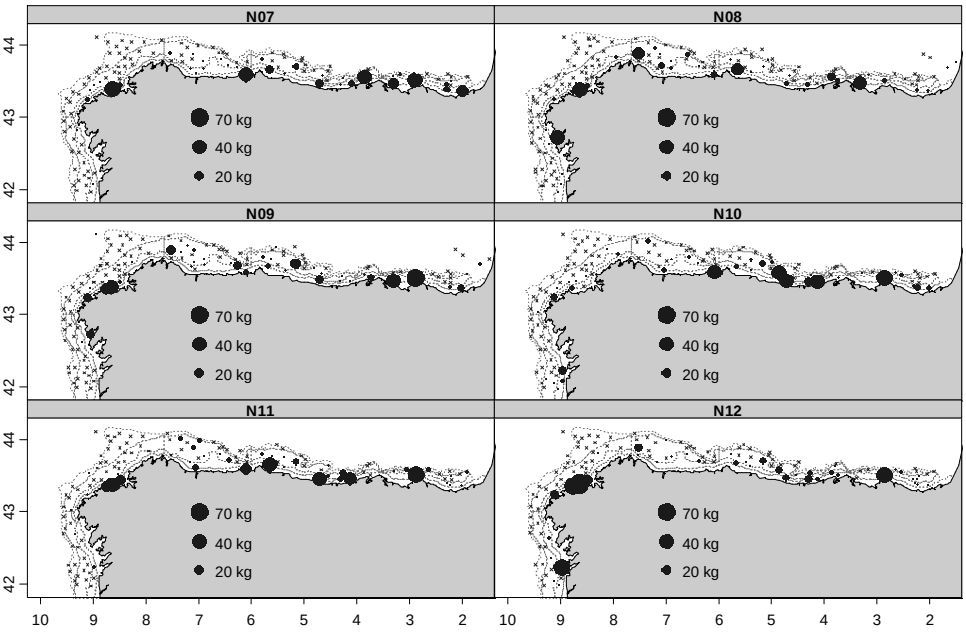

Figure 17 Geographic distribution of *Raja clavata* catches (kg/30 min haul) in North Spanish Shelf bottom trawl surveys between 2007 and 2012

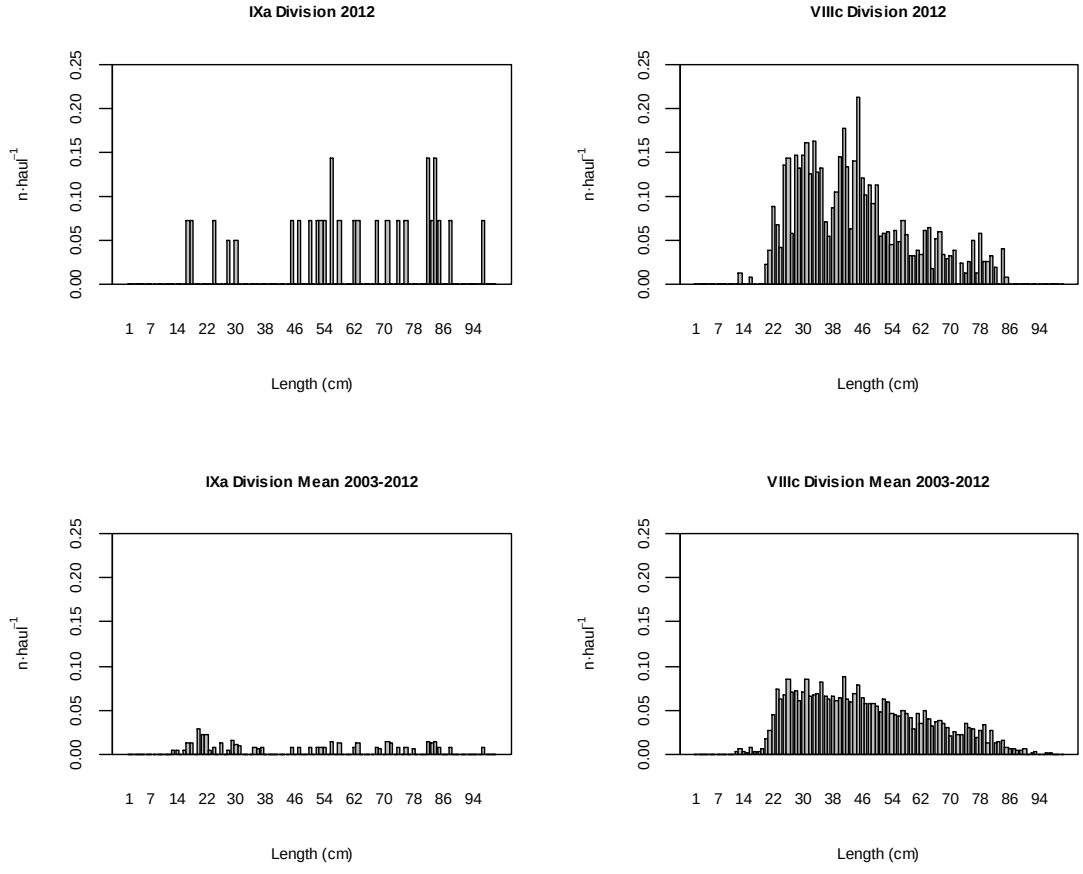

Figure 18 Mean stratified length distributions of *Raja clavata* in the North Spanish Shelf surveys (2003-2012)

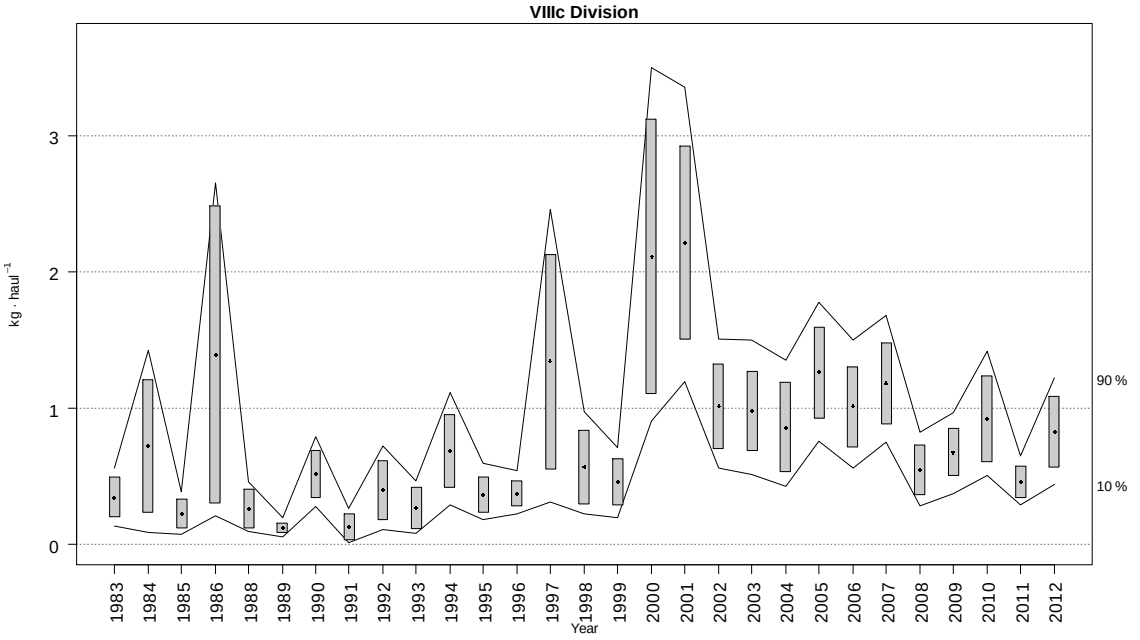

Figure 19 Changes in *Raja montagui* biomass index during the North Spanish shelf bottom trawl survey time series (1983-2012 but in 1987) in the VIIIc division covered by the survey. Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

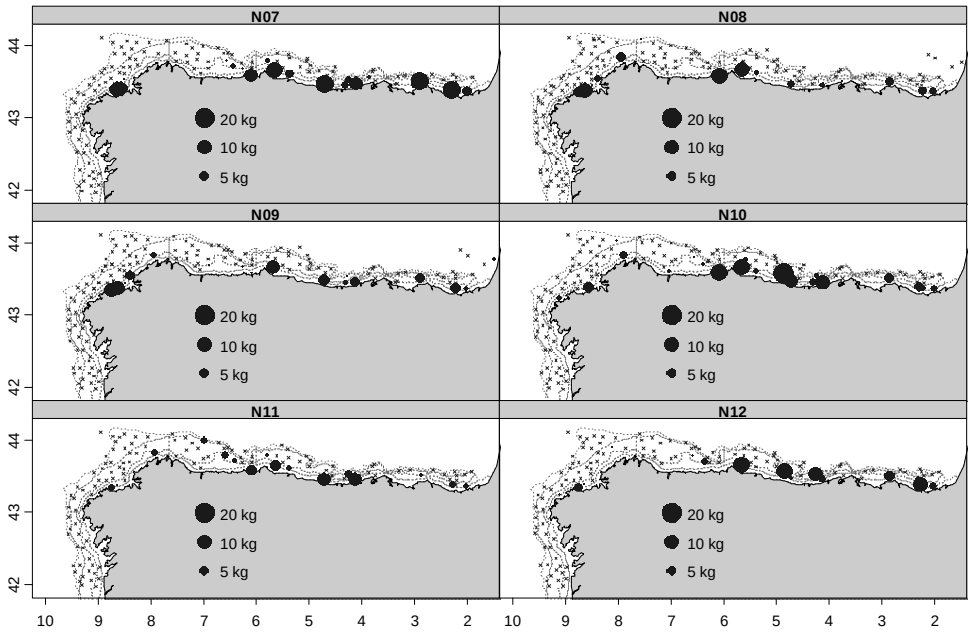

Figure 20 Geographic distribution of *Raja montagui* catches (kg/30 min haul) in North Spanish Shelf bottom trawl surveys between 2007 and 2012

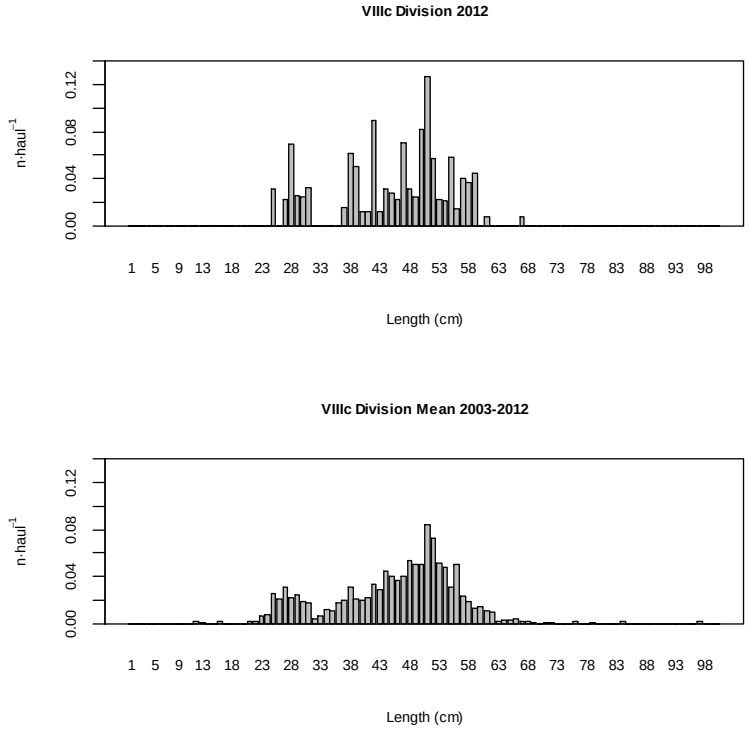

Figure 21 Mean stratified length distributions of *Raja montagui* in the North Spanish shelf surveys (2003-2012)

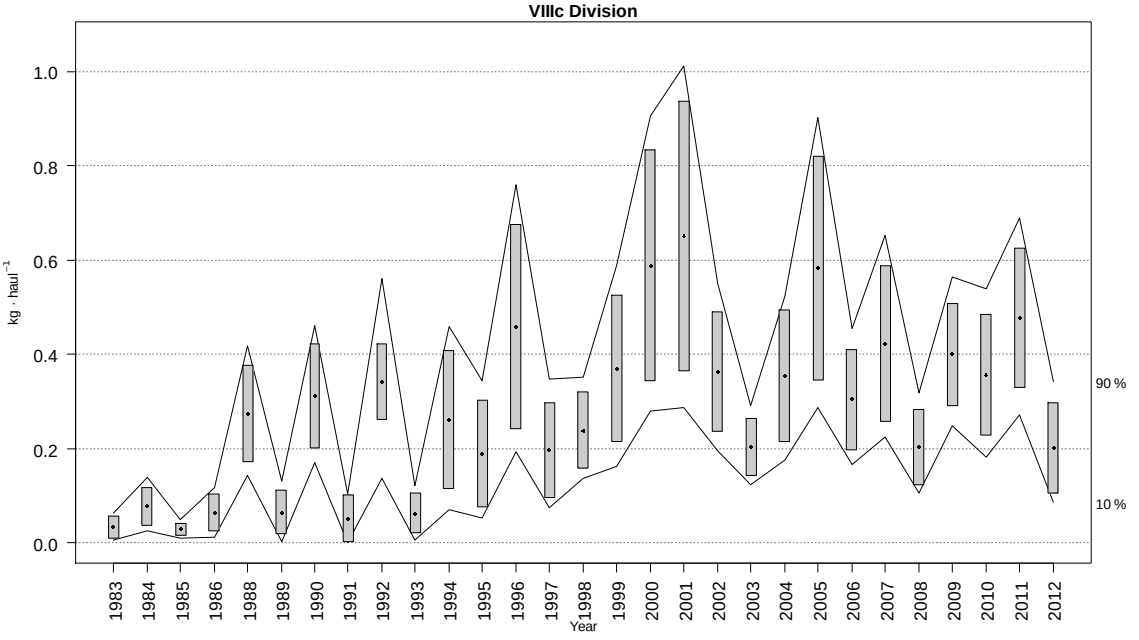

Figure 22 Changes in *Leucoraja naevus* biomass index during the North Spanish shelf bottom trawl survey time series (1983-2012 but in 1987) in the VIIIc division covered by the survey. Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

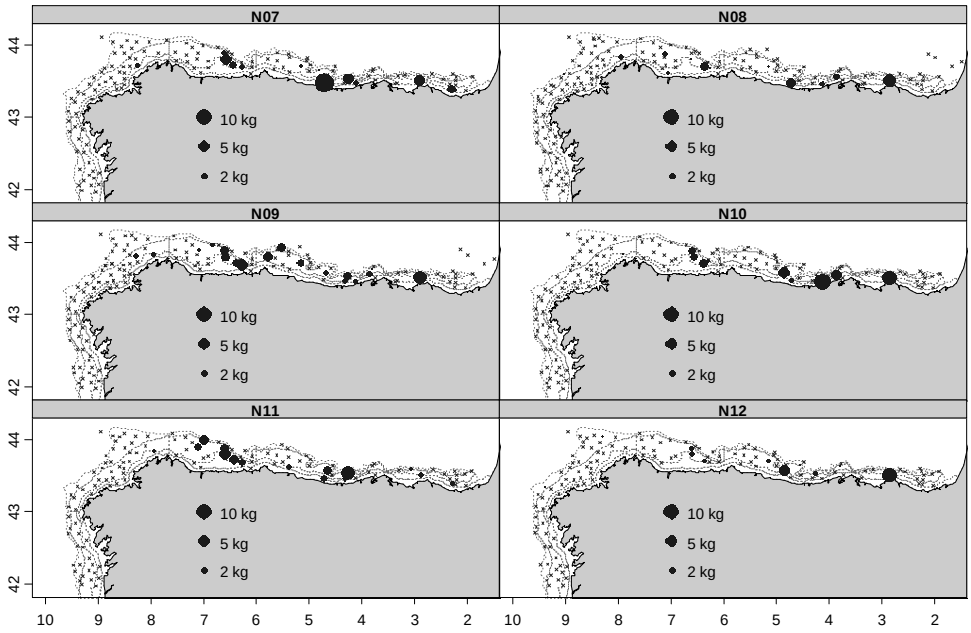

Figure 23 Geographic distribution of *Leucoraja naevus* catches (kg/30 min haul) in North Spanish shelf bottom trawl surveys between 2007 and 2012

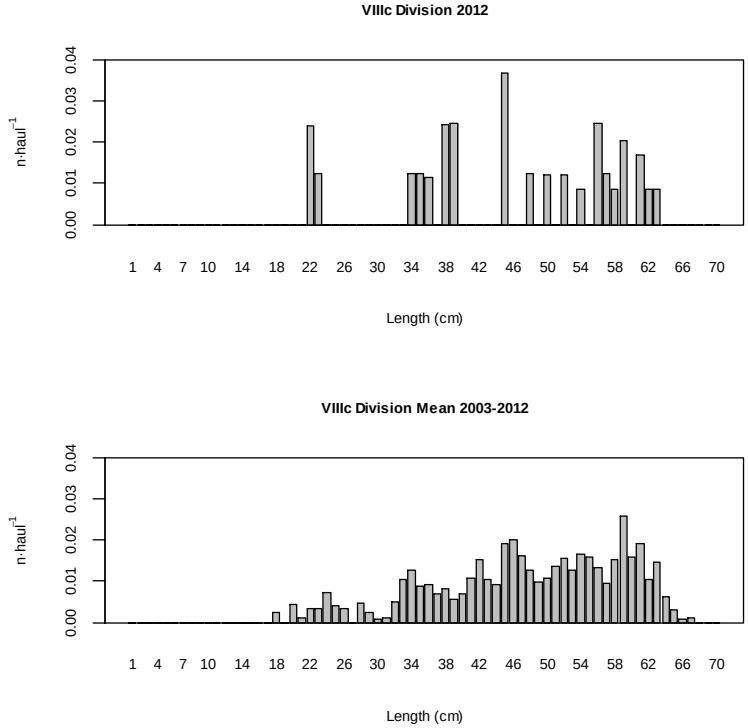

Figure 24 Mean stratified length distributions of *Leucoraja naevus* in the North Spanish Shelf surveys (2003-2012)

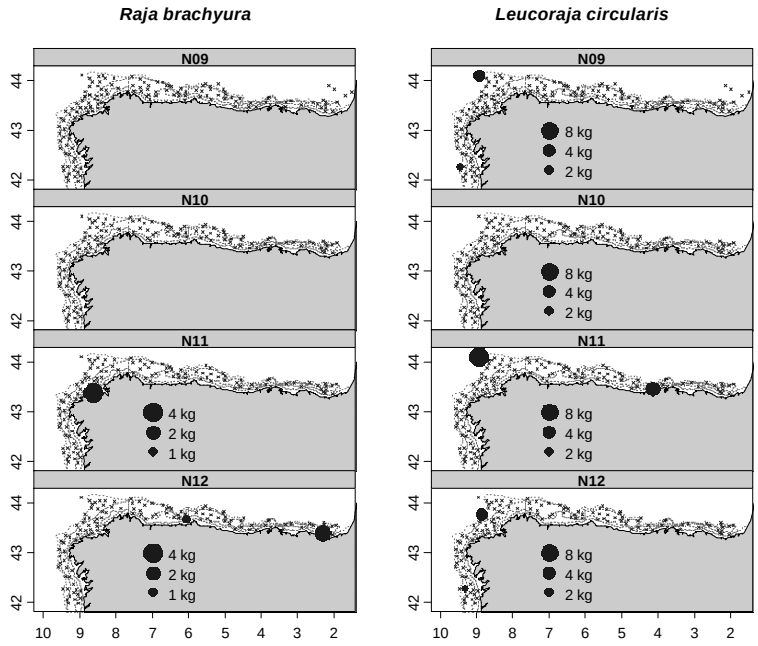

Figure 25 Geographic distribution of *Raja brachyura* and *Leucoraja circularis* catches (kg/30 min haul) in North Spanish Shelf bottom trawl surveys between 2009 and 2012